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SCIENTIFIC EXCHANGE OF GERMPLASM RESOURCES BETWEEN THE U.S. AND THE P.R.C.

August 17 - September 13, 1979

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OF GERMPLASM RESOURCES
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SCIENTIFIC EXCHANGE OF GERMPLASM RESOURCES BETWEEN THE UNITED STATES AND THE PEOPLES REPUBLIC OF CHINA

U. S. GERMPLASM TEAM REPORT

October, 1979

I Team Organization and Objectives:

In accordance with Articles 1, 2, and 3 of an agreement between the governments of the United States and the People's Republic of China (PRC) on cooperation in science and technology, dated January 31, 1979, the exchange of plant germplasm teams between the two countries was implemented. A 7-man team from the PRC toured the U. S. for 4 weeks during July 1979. The U. S. Germplasm Team was assembled by the Department of Agriculture, Science and Education Administration, and travel arrangements were made for it to tour PRC from August 16 to September 13, 1979. Members of the U. S. Team are listed in Attachment 1.

The trip arrangements were according to an agreement reached with the PRC during Secretary Bergland's visit to Beijing on November 4-14, 1978, and contained the following objective:

> To study, select, and arrange for acquisition by the United States of germplasm of soybeans, sorghum, millets, and vegetables.

In order to reach that objective, the Team presented to its contacts in the Foreign Affairs Division of the Chinese Academy for Agricultural Sciences (CAAS) a list of goals and specific objectives that it desired to pursue during the trip (Attachment 2).

As a gesture of friendship and cooperation, the U. S. Germplasm Team carried with it a broad collection of germplasm of soybean, sorghum, millet and several vegetable crops. The collection contained 174 items (Attachment 3), which were turned over to officials at the Crop Germplasm Institute, CAAS, in Beijing.

II Principal Contacts and Itinerary:

The Germplasm Team met at the Department of Agriculture in Washington, DC on August 13, 1979 for briefing. The briefing was organized and presented by Mr. Roger Neetz and Ms. Meg Campbell of the Office of International Cooperation and Development with assistance from Ms. Sharon Kenworthy of the Germplasm Resources Laboratory, SEA-AR, Beltsville, Maryland.

The U. S. Team arrived in Beijing August 17, 1979. We were met at the Beijing airport by Mr. William Davis, Jr., Agricultural Attache,

American Embassy in Beijing. Mr. Shen Chin-Po, Head Foreign Affairs Division, CAAS, accompanied by Mr. Zhou Zhen Hua and Mr Zhao Weijun, briefed us on arrangements for the tour in PRC and presented us with an itinerary for the entire 4 weeks of travel. Mr. Zhou would serve as our official guide and accompany us throughout the trip. Mr. Zhao would serve as our Chinese interpreter throughout the trip. Mr. Zhao also accompanied the PRC Germplasm Team to this country earlier and served as their interpreter. A day-by-day itinerary for the trip is given in Attachment 4.

III The Status of Germplasm Collection and Maintenance in PRC:

On August 18, 1979, the U. S. Germplasm Team visited the Crop Germplasm Institute (CGI) of the CAAS. A report on the status of germplasm collection and maintenance in the PRC was given by Mr. XU Yuntian, Deputy Director of CGI.

There was very little activity in germplasm collection and maintenance in the PRC before 1956. Up to that time, farmers grew native varieties on their own parcels of land. Beginning in 1956, the government asked the people to send seed of their varieties to a research center in the region. About 220,000 accessions of 40 field crops were collected by 1958. All the germplasm was maintained in the region where it was collected because there was no national institute. After the initial collection of germplasm, the land was communized and land races used by individual farmers were often replaced by a few common varieties.

Plans to build a national germplasm institute were halted by the cultural revolution. Some of the 220,000 accessions collected by 1958 were lost during the cultural revolution, although the exact amount is not known. After the cultural revolution, the research centers resumed their activities. On August 20, 1978, the CGI was founded as one of the institutes of the CAAS.

The CGI is responsible for coordinating germplasm collection, maintenance, and research in the PRC. It has eight laboratories; (1) plant introduction, a laboratory formed before CGI was founded, (2) seed storage, (3) rice research, (4) cereal research, (5) corn and Bean (Phaseolus), (6) sorghum and millet, (7) disease resistance evaluation, and (8) plant physiology, biochemistry, and genetics. The germplasm for some crops is maintained by special institutes of the CAAS. For example, national sorghum and millet research, similar to that conducted by the USDA, is administered by the CGI. Cotton, however, has a separate institute in the CAAS. Similar independent institutes of the CAAS include the Vegetable Research Institute, the Oil-Bearing Crops Institute, and the Fruit Tree Research Institute. The crop institutes of the CAAS are located at different places in the PRC. The Oil-Bearing Crops Institute is located at the city of Wuhan in Hubei province, the Fruit Tree Research Institute is at the city of Zhengzhou in Henan province, and the Vegetable Research Institute is in Beijing.

There is no national system at present for assigning accession numbers or cataloging germplasm in the PRC, but the CGI is actively developing plans for such a system. They desire a national system that would catalog and coordinate all germplasm reserves, including collections maintained in separate institutes or provincial agricultural academies. One current problem is the lack of any long-term storage facilities for seed in the PRC. A facility currently is being built at the CGI in Beijing. Plans are being developed to build similar facilities in crop institutes and provincial agricultural academies.

In February 1979, national germplasm meetings were held in the PRC to develop goals for the future. A first priority was to recollect native varieties of all crops, and such collection is underway. They are aware that accessions lost during the cultural revolution may no longer be available. A training course was held in each province and collection teams were developed that included a geneticist, breeder, and pathologist. Collection will be accomplished by requesting seed from the communes. The collection teams will serve to back up the collections made by the communes. The teams also will emphasize collection of wild species. Several hectares of wild rice species have been identified in several provinces. A team has been collecting wild soybeans along the Yellow river during the summer of 1979. National preserves of wild species are being considered for some crops.

The CGI is developing cooperative germplasm programs with other countries and national research centers. A cooperative program of germplasm exchange, training, and research is being developed with the International Rice Research Institute (IRRI) and CYMMT. There presently are no foreign scientists studying germplasm in the PRC.

The excellent report of XU Yuntian was repeatedly verified by the U. S. Germplasm Team during the visits to five provinces. There is a good understanding among Chinese scientists of the need for collection and maintenance of germplasm, a desire to improve the efficiency of germplasm maintenance, and a common desire for a national germplasm system, similar in principle to that in the United States. Details of the system that will be used in the PRC are still evolving and many years of effort will be required to finalize the project.

In the following four sections, the current status of germplasm collection, maintenance, and research in the PRC will be described for soybean, sorghum, millet, and vegetable crops. Information will be provided primarily for those locations where germplasm collections were actually seen or discussed.

A. Soybean

Soybean germplasm collections are maintained primarily at the provincial agricultural academies. There is a collection of southern germplasm at the Oil-bearing Crops Institute, Chinese Academy of Agricultural Sciences, Wuhan, Hubei, People's Republic of China. SUN Darong, a member of that institute, was a member of the PRC Germplasm Team that visited the U. S. from July 9 to August 4, 1979.

A discussion of soybean germplasm was held on August 23 with WANG Chin Ling, Professor of Plant Genetics and Breeding, Northeast Agricultural College, Harbin, Heilongjiang. Professor WANG is considered the leading authority on soybean breeding and genetics in the PRC. He was a member of the first team of agricultural scientists from the PRC that visited the U. S. in 1974. Professor Wang indicated that native soybean varieties were collected before the communes and related organizations were formed. About 5,000 varieties were collected throughout the PRC, and about 3,000 to 4,000 are still available. There is only a limited collection of wild species, but there is renewed interest in expanding that collection. A team is collecting wild species of Glycine along the Yellow river in 1979.

Germplasm collections were observed in five provinces. The collection at the Heilongjiang Agricultural Academy, Harbin, Heilongjiang is maintained by WU Ho Li, WONG Cuo Ying, and LI Cuo Lan. They were reproducing 100 accessions, some of which are currently grown commercially. Maturity groups 0 to I are grown in the province. They have grown U. S. varieties, but they are generally too late or susceptible to disease. They are interested in germplasm from the U. S. that is resistant to alkali soils and cyst nematode. They have begun to screen their collection and that of other provinces for resistance to cyst nematode, primarily in western parts of the province where the disease is important. They also are screening for resistance to soybean mosaic virus, a common disease in the PRC.

The soybean collection of the Liaoning Agricultural Academy was maintained by CHANG Ren Shuang at the Tieling Agricultural Research Institute, Tieling, Liaoning. He indicated that the soybean probably originated in Liaoning province because the wild soybean grows everywhere and the stages of evolution are apparent. There were 823 accessions collected in the province during 1956 and 575 are still available. They also have 209 accessions from other parts of China and 178 from foreign countries, of which 42 are from the U. S., 31 from Japan, and the others from Korea or European countries. Soybean mosaic virus is their most important disease. Most of their widely grown cultivars in the Tieling area mature later than Amsoy and earlier than Wayne.

The soybean collection at the Shandong Agricultural Academy, Jinan, Shandong, is maintained by LI Tsi Shing. There were 2,930 accessions after collections were made in 1956 and 1957. After removal of duplications, the number was reduced to the current group of 567 entries. The collection is highly variable for growth type and pest resistance because of the variable growing conditions in the province. Two accessions that appeared to be Glycine soja were in the germplasm nursery. The widely grown cultivars were from about late group IV to early group VI. Resistance to viruses was a major concern in the breeding programs in the province. Seed of their soybean collection is stored in northern provinces where the air is cooler and drier and viability is maintained for longer periods of time than in Shandong province.

The soybean collection for Henan province is maintained by HSIE Ying Li at the Henan Agricultural Academy, Zhengzhou, Henan. The number of accessions was not indicated, however, many of the accessions from the collection of 1956 are still available and a recollection is planned for the winter of 1979-1980. Seed is stored in heavily insulated rooms and can be maintained for about three years. Maturity group III seemed most appropriate for the practice of double cropping soybeans after wheat, a common practice in the province. Virus resistance is given highest priority in developing new cultivars.

The soybean collection for Shaanxi province is maintained by TAI Yong Min at the Shaanxi Agriculture and Forestry Academy, Wu Kong, Shaanxi. A group of 75 accessions are being grown for the first time in 1979. Collection of native varieties in the province is just beginning. The accessions ranged from black seeded indeterminate types collected in the dry infertile areas in the southern part of the province. Maturity groups V and VI seemed most appropriate for the Wu Kong area. There were no serious pest problems in the area.

B. Sorghum

Sorghum bicolor (L.) Moench is a major cereal crop grown in the northern and central provinces of the People's Republic of China. Sorghum ranks in importance from third to considerably below fifth or sixth in those areas visited. Although no government figures were given, we were told that sorghum may occupy an area of ten million hectares. The acreage was less than that for maize however.

Chinese sorghums were obviously developed for very unique characteristics. They retain the open panicle type and associated clasping glumes of the nervosum type as well as the longer panicle branches, in many respects resembling broomcorn. The germplasm base in Chinese sorghums appeared to be very narrow and represents only the kaoliang and broomcorn classes (group 8- Nervosum, Kaoliang and group 9 - Nervosum, Broomcorn). The five provincial Agricultural Academies had in excess of 3,000 accessions of sorghum which varied in plant height, seed color, maturity, and other characteristics. Several types of grain sorghum were also available, including the waxy endosperm which was used specifically for the production of food products.
The cytoplasmic-genetic male sterility system used throughout China is 'Combine Kafir 60', an A-line developed in Texas in 1956. There is work underway, however, to develop local female lines. There appeared to be a deficiency among the Chinese germplasm resources for good non-restorer genotypes. This is one area in which assistance can be given by exchanging potential female parental types with the PRC.

Kaoliang type sorghums were widely used for several products, such as flour (a rice-like product make from pearled kernels), sugar, alcohol, livestock feed and then the plants were used for building materials, firewood, etc. Perhaps the most publicized use is that of sorghum wine, a strong distillation of fermented sorghum grain.

Yield of grain averaged from 2,000 to over 8,000 kilograms per hectare. The higher yields were found in the Liaoning Province, which appeared to be one of the most productive areas for sorghum production. Sorghum appeared to be a major crop in this particular region, whereas in the northern areas and further south it appeared to be a second or third choice crop, similar to the marginal production areas in the United States. There were concerns expressed against hybrid sorghum because, when the best local white seeded waxy endosperm Kaoliang types were crossed to 'Combine Kafir-60', the F_1 hybrids were also brown seeded and had poor panicle characteristics unfit for the production of brooms.

In Liaoning Province, where the most outstanding sorghum materials were observed, large areas of non-brown, non-Kaoliang type sorghum hybrids were producing very high yields of grain. The F_1 hybrids there were between 5.5 to 7.0 feet tall, when planted in 20 inch rows, and yielding about 8 to 9 thousand kilograms per hectare. Germplasm resources at this center were different in many ways because of the durra, milo and caudatum/kaura types which existed in the breeding materials. Certainly, the most concentrated areas of sorghum production were north of Beijing with centers in Liaoning, Kirin, and Heilungjiang Provinces. There was considerably less sorghum grown in the central areas of Shandong, Henan and Shaanxi Provinces.

The disease situation, as observed in August 1979, was similar to that of the U. S. A. There was no downy mildew, long smut, ergot or striga observed. We did see ample amounts of head smut and loose kernel smut, however. These two diseases were causing concern in the Liaoning Province where much of the local material was damaged by the fungi. Further south in the central area of Shaanxi and Henan Provinces, there was interest in resistance to MDMV because most of the local types were susceptible. Resistant U. S. types showed the same levels of resistance as observed in the United States.

The only major insect problem observed was the 'grey sugarcane aphid' in the Heilungjiang and Liaoning Provinces. Although the aphid did little or no plant damage, it did secrete a large amount of honeydew, which created handling problems. We did not see evidence of 'sorghum midge', although we were advised that it may be present.

There are several provincial collections of sorghum in China. These number from 100 to over 1000 entries per collection; the most complete being in Henan Province. There we saw herbarium and stored samples of 1,065 items. Although the germplasm base is narrow, we feel that it offers a usable addition to the World Collection of Sorghum Germplasm. The most likely useful trait could be cold tolerance, which is known to exist among Kaoliang types. We encouraged exchange and further collection of sorghums within China. By the same token, the Chinese sorghum breeders were extremely anxious to exchange germplasm and to cooperate and especially to correspond with U. S. scientists. We feel that both countries would benefit substantially from the exchange of sorghum germplasm and related scientific information.

Significant benefits may be derived also from exchanging scientists to study the sorghum germplasms in both countries. Persons especially concerned with sorghum in the PRC are listed below:

Xu Yun-Tain, Deputy Director of the Crop Germplasm Institute
Chinese Academy of Agricultural Sciences
Beijing, People's Republic of China

Yen Shi-Sheng, Associate Researcher, Sorghum Breeder
Agricultural Academy of Heilungjiang Province
Harbin, People's Republic of China

Kou Xin-San, Senior Researcher in Sorghum
Henan Provincial Agricultural Academy
Zhenzhon, Henan, People's Republic of China

Chen Bao-Chin, Head, Sorghum Laboratory
Northwest Water Conservation Institute
Shaanxi Provincial Agricultural and Forestry Academy
Wu Kung, Shaanxi, People's Republic of China

Mrs. Chang Xie-Ning, Sorghum Researcher
Shandong Provincial Agricultural Academy
Jinan, Shandong, People's Republic of China

Chao Kai-To (Sorghum Breeder) Director of Crop Breeding Institute
Liaoning Provincial Agricultural Academy
Shenyang, Liaoning, People's Republic of China

Some of the sorghum collections that exist in the People's Republic of China are listed below by province and type:

Province	Type	Number
Heilungjiang	A-B lines	30
	R-lines	80
	Collected local varieties	144
	Foreign introductions	88
	Miscellaneous	223
	Total Collection, local and introduced	565
Liaoning	Collected local varieties	700
	Collected other states	300
	Total Collection, local and introduced	1000
Shandong	Total Collection, local and introduced	800
Henan	Total Collection, local and introduced	1065
Shaanxi	Collected local varieties	34
	Collected other states	76
	Total Collection, local and introduced	110

This trip by the U. S. Germplasm Team to the People's Republic of China significantly expanded the knowledge of sorghum in the PRC that was obtained by represenatives of the National Academy of Sciences in 1974. The trip allowed further exploration of the exact location of germplasm collections and the size of these collections that could possibly be exchanged with U. S. scientists.

C. Millet

Foxtail (Setaria italica) was the major millet grown in the five provinces that we visited. Some proso (Panicum miliaceum) was seen growing in fields but we saw no germplasm collections of this species. The millets ranked from 3rd to 7th in importance in the provinces visited (based on total hectares planted).

A tremendous amount of valuable Setaria germplasm exists in China. The 5 provinces had 3226 accessions with variation for plant height, seed size, maturity, tillering, seed color, leafiness, head size, head compactness, drought tolerance, pest resistance, glutinous vs non-glutineous endosperm, etc. We were told that they had cytoplasmic-genic male sterility at the Hsin Hsiang, Henan Province location. A large percentage of the accessions are still grown by the peasant farmers.

Millet grain is used for human food. In each province we were told about the high nutritive value of millet grain for nursing mothers. The stalks were used as fodder for livestock (some for building). Most of the Setaria grain is yellow and non-glutinous. Some of the glutinous types were used to make wine. Yields averaged 2000-3000 kg/ha. Millet was mainly grown on the poor (unfertilized) and droughty soils because it grew better than any other crop under these conditions.

The major diseases on Setaria were smut, downy mildew, and red leaf disease. There were few disease problems in the Henan and Shaanxi Provinces. Stem borers were the most serious insects.

We were told in the Henan Province that most of the proso improvement work was done in the Gansu and Shaanxi Provinces, but we did not visit those sites.

The Chinese millet breeders were anxious to exchange germplasm and to correspond with U. S. scientists. Both countries could benefit from an exchange of millet germplasm and scientific information.

D. Vegetable Crops

Vegetable germplasm in PRC is maintained at many locations throughout the country. It is primarily in the hands of vegetable breeders at the CAAS and the provincial agricultural academies. There is currently underway an effort by the Vegetable Research Institute of the CAAS to bring together a national germplasm collection for the more important vegetable crops. The Institute now has 60 species of vegetables containing over 200 varieties and lines. Once the National Seed Storage Facility is completed, plans are to greatly enlarge that collection by bringing in local cultivars and strains from provinces throughout the country. Mr. Li Shu De, Deputy Director of the Vegetable Institute and Leader of tomato breeding work, briefed us also on their vegetable research programs at CAAS.

There are large vegetable communes near the major cities throughout China. Specialists in these communes maintain their own cultivars and they provide seed for the production brigades within the commune. They have no effective seed storage facilities, so breeding lines and cultivars must be maintained by continually planting and collecting fresh seeds.

The months of August and September were not the best time of year to observe vegetable production in China. However, scientists at the provincial academies briefed us on their work in vegetable breeding and the extent of their germplasm base for breeding purposes.

At the Horticultural Institute of the Heilongjiang Agricultural Academy, we were advised that the germplasm collection had just begun following a major disruption in scientific research between 1972 and 1976. During this period much of the material that had been collected was lost. Mr. Cheng Tsi Der, Deputy Director of the Institute, and Madam Kuang Chen Yen, Head of the Vegetable Lab. told us that they now had about 50 varieties of cabbage, cucumber, cantaloupe, eggplant, pepper, tomato and watermelon. Most of these accessions were used to some extent in the breeding programs. They also reported having Verticillium resistant F1 hybrid eggplants and powdery mildew resistant cucumbers.

Vegetable research in the Liaoning Province was being conducted at the Shenyang Agricultural Research Institute. This Institute is under the jurisdiction of the government of the city of Shenyang. Mr. King Huong-Shang, Director, and Mr. Chao Tsung Run, Head of the Vegetable Laboratory, described their research on vegetables and listed 33 different crops comprising some 140 varieties and 320 other accessions. They were responsible for maintaining all chinese cabbage and cucumber germplasm for the province along with 98 pepper and 171 tomato accessions.

Vegetable research in the Shandong province seems to have received great emphasis in recent years, and large collections of some species have been made. A great deal of effort had been made to group varieties according to morphological characteristics. To date, 352 varieties of cabbage, 208 radish, 214 cucumber, 136 eggplant and 397 local sweet potato varieties have been catalogued. Another 200 sweet potato lines are maintained at the Yen-Tai District Agricultural Research Institute at Yen-Tai. Mr. Hou Chi Wei, Vegetable Germplasm Researcher, and Madam Chung Tse Xia, Sweet Potato Research, of the Shandong Agricultural Academy, Jinan, described their work in detail and expressed a strong desire for further exchange of germplasm with the U. S.

A very strong program of research, teaching and extension in vegetable crops is carried on at the Shandong Agricultural College at Tai-An. Professor Li Chia Wen, Dean of the Horticulture Department, educated in the U. S. in 1945-46, had made extensive studies of the origin and variation of vegetable crops in China. Professor Li is knowledgeable of vegetable germplasm throughout China and represents a valuable source of information about vegetable germplasm in China. His address is Prof. Li Chia Wen, Department of Horticulture, Shandong Agricultural College, Tai-An, Shandong, PRC.

Vegetable research in the Henan Province is of lesser importance than that for agronomic crops. Sweet potato research is conducted at the Provincial Agricultural Academy in Zhengzhou. Mr. Mao Jian Hua is in charge of that work. As in most other provincial academies, the sweet potato is treated as a field crop and not a vegetable. Roots are used primarily for animal feed. The sweet potato collection at the Henan Academy consisted of 216 entries, mostly the white-fleshed types.

A limited amount of vegetable research is done at the Zhengzhou Agricultural Institute on 5 major crops. Mr. Chai Kou Chun, Director, told us there was no germplasm being collected and none maintained at that location, other than their own breeding lines. Major emphasis was on hybrid cultivar development. The Red Brigade of the Chilying Peoples Commune had a large vegetable production unit. They grew 30 different vegetable species and produced their own seeds.

In the Shaanxi Province, a vegetable germplasm collection was in the very preliminary stages. Collections of local varieties and certain breeding lines were being maintained by breeders and many of these were also used by vegetable production brigades in the province. Mr. Chao Chech-Ya, Head of the Vegetable Breeding Lab at the Shaanxi Agricultural and Forestry Academy at Wu Kung, and Madam Lu Ming Chiang, Tomato Breeder, described their work which covered some 79 species of vegetables and 307 varieties. Much work had gone into developing hybrid tomatoes. Madam Lu acknowledged valuable contributions of American varieties 'Manapal' and 'Floradel'.

IV Diseases and Pathogens:

An important consideration in germplasm exchange and the transport of live plant materials from one continent to another is the spread of plant diseases. For this reason, one member of the U. S. Germplasm Team was a plant pathologist. Observations were made at each site visited for the presence of diseases and attempts were made to identify the pathogens. Attachment 5 is a tabulation of diseases and pathogens that were encountered in Beijing and vicinity and in the Provinces visited by the Germplasm Team. This list was compiled from 1) direct observations made by members of the Germplasm Team, 2) statements made by Chinese scientists in response to queries by team members and 3) statements volunteered by the Chinese scientists. It should be recognized, however, that diseases not encountered during this visit may also occur on the hosts listed.

V Accomplishments:

The U. S. Germplasm Team was able to observe and/or study crop germplasm collections, maintenance procedures and utilization in the National Academy and in five provinces in the northern half of PRC. We were not permitted to collect materials from the wild and few crops were at proper state of maturity to collect seeds directly from domestic cultivars. Nevertheless, we requested, and were given, seeds of items judged to be of particular value to U. S. germplasm collections. Attachment 6 is a list of items by

crops that were returned to the Germplasm Resources Laboratory, SEA-AR, Beltsville, Maryland, for processing through quarantine. The seeds were given to Mr. Davis, Agricultural Attache, at the American Embassey in Beijing. The seeds were sent via diplomatic pouch to the U. S.

The U. S. Germplasm Team was permitted to collect soybean root nodules from plantings in each of the provinces visited. This was the first collection of Rhizobium japonicum made by U. S. scientists in the PRC. The specimens will be evaluated and compared to U. S. strains for efficiency of nitrogen fixation and host specificity. In addition to their scientific value, they represent the opportunity for cooperative research between the U. S. and PRC on symbiotic nitrogen fixation.

The system of collection, maintenance, and utilization of crop germplasm in the PRC is now better understood. The CGI and cooperating scientists in provincial agricultural academies have the goal of preserving native varieties and wild species. Chinese scientists understand the value of their germplasm resources and are dedicated to maintaining them. They seem willing to exchange collections and to conduct cooperative research on evaluation of the germplasm. Cooperative research on wild species, such as Glycine soja, probably will not occur until the PRC has had sufficient time to collect and evaluate the material in China. The U. S. Germplasm Team made it clear that U. S. scientists are ready to assist in collecting and evaluating the wild species.

Subjects for cooperative research were identified that would be mutually beneficial to the PRC and U. S. Research on cyst nematode, viruses, symbiotic nitrogen fixation, and germplasm evaluation, maintenance and utilization would be of importance to both countries.

Perhaps the most significant accomplishment of this trip was the personal contacts and friendships that were established with the Chinese scientists in the national and provincial academies that we visited. These contacts will provide a basis for further exchanges between agricultural scientists in both countries for years to come.

VI Recommendations:

1. We recommend that efforts continue to exchange whole blocks of germplasm with the PRC. Exchanging blocks of germplasm would insure that important items not be overlooked and would prevent duplications and recurring requests for the same or similar materials from individual scientists. A complete and orderly exchange would be beneficial to both countries.

2. Exchanges with the PRC are recommended to include cooperative research and the exchange of scientists and scholars in selected fields. The exchange of soybean scientists for cooperative research and germplasm evaluation should be given high priority. Attachment 7 is a proposal that was presented to Mr. Jen Cheh, Secretary General, CAAS, for consideration and discussion at the end of our tour in China. While our suggestions were

accepted in principal, no positive steps could be taken at that time to carry out the exchanges that we had suggested. We recommend that the proposals contained in Attachment 7 be included in future plans for scientific exchange.

3. We recommend that pathologists be sent to China to study those diseases that do not occur in the U. S. Several plant diseases reported from PRC are not present in the U. S. Included, for example, are late wilt (Cephalosporium maydis) on corn and soybean rust (Phakopsora pachyrhizi), scab (Sphaceloma glycines), sleeping leaf disease (Septogloeum sojae) and pod blight or pod rot (Macrophoma mame) on soybean. Knowledge of the behavior of these diseases in China and information on the availability of resistant germplasm would be valuable in helping to assess the potential danger of the causal pathogens to U. S. crops should they inadvertently be introduced. Arrangements might also be made to test, in China, selected varieties and breeding lines to pathogens identified as potentially dangerous. This would permit evaluation of disease reaction prior to a possible appearance of the exotic pathogens in our fields.

   From the U. S. point of view it would be advantageous to learn more about plant protection activities in PRC and to assess in detail the occurrence of plant pathogens and their impacts. Our quarantine personnel require information on the distribution and prevalence of plant pathogens (both in a geographical sense and in a temporal sense) for the logical construction of quarantine regulations and procedures as trade, commerce, and travel between China and the United States expands.

4. Based on observations by the Germplasm Team in the provinces visited, we concluded that the PRC possessed many unique, and potentially valuable collections of fruit trees, especially apple, pear and peach. Collections of rice, wheat, maize, and peanut are also extensive in PRC. Valuable sources of germplasm of Cynodon, Eremochloa, and Zoysia grasses in southern China and Agropyron and Elymus in western China are known to exist in these areas of origin. We recommend, therefore, that germplasm teams be established for the purpose of studying and arranging for the exchange of these crops.

5. It is recommended that future exchange teams be provided an American interpreter/translator. Not that the interpreter provided by the Chinese for the Germplasm Team was incompetent, but one interpreter for a 7-man team was not adequate. The services of a translator was needed also during private study sessions and during routine report writing.

6. We recommend that future teams be briefed thoroughly on their obligations, authority (including limits of that authority) and protocols prior to departure for the PRC. This would be especially helpful to the team leader in carrying out his responsibilities as official spokesman. A conference with a previous team leader would be well worth the cost and effort.

Attachment 1

MEMBERS OF THE U. S. GERMPLASM TEAM TO PRC
August-September 1979

USDA, Science and Education Administration

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Attachment 2

GOALS AND OBJECTIVES OF THE U. S. GERMPLASM TEAM
AUGUST 17, 1979 through SEPTEMBER 12, 1979

The U. S. Germplasm Delegation was assembled by the U. S. Department of Agriculture to pursue the following goals:

1. To learn the state of the art of germplasm and related technology and progress in the PRC.

2. To learn the administrative organization in germplasm, and to establish personal contacts with Chinese administrators and scientists in these areas.

3. To learn the PRC system of importation and exportation of germplasm, including quarantine requirements and facilities in the PRC, and procedures which are efficient and rapid. To explore procedures with the U. S. Embassy in Beijing for expediting transportation of materials to and from U. S. institutions.

4. To exchange information with Chinese counterparts on germplasm available in either country, to identify germplasm useful to and desired by either country, to decide on priority categories to be exchanged and to initiate actual exchanges.

5. To identify specific areas for cooperative research between the PRC and U. S. involving various institutes, universities, governmental agencies and other organizations.

In addition to the above stated goals, the Team has adopted the following specific objectives:

1. To make in-field studies of variations among crops and grasses being grown in different environs of PRC as well as plant to plant variations within varieties. Crops of particular interest are: sorghum, millet, soybean, turf grasses, sweet potato, tomato, beans (all kinds), peas, watermelon, cucumber, cantaloupe, carrots, onions.

2. To make in-field studies of plant diseases, nematodes, and insects that occur on the various crops and identify resistances that may provide desirable genetic diversity to germplasm pools.

3. To collect seeds and live specimens when necessary, or arrange for seeds to be sent to the U. S. of various plant species that may provide useful germplasm for breeding programs in the U. S.

4. To collect specimens of nitrogen-fixing bacteria (root nodules) on soybeans in each of the provinces visited.

5. To find sources of resistance to soybean rust and study diseases in general on crop plants. Also to learn how plant materials are screened for disease resistance and what major diseases are present.

6. To discuss possible arrangements for future exchanges of germplasm, scientific knowledge and the possibility of having exchanges of cooperating scientists; and the reciprocal testing of advanced breeding lines or newly developed varieties.

Attachment 3

List of Seeds Carried by the U. S. Germplasm Team to the PRC

Soybean:

Ada	Corsoy	Columbus	Centennial
Norman	Wells	Crawford	Davis
McCall	Sloan	Hill	Bragg
Clay	Beeson	Essex	Ransom
Wilkin	Pella	Forrest	Braxton
Evans	Oakland	Bedford	Cobb
Swift	Cumberland	Lee	Dowling
Hodgson 78	Williams	Tracy	Hardee
Weber	Elf	Jupiter	UFV-1-IX-Sel.
Coles	Union		

Sorghum:

ATx 622, 623 and 624 and B Line (Maintainer)

Tx 2714 - Tx 2733	IS 1207 C	IS 5887 C
TP 11R	1309	5892
TAM Bk 51 (R-line)	1335	6271
TAM Bk 52 (B-line)	1526	6389
CS 3541 (CSV4)	2177	6418
GPR 148	2198	6439
TAM 428	2246	6440
TAM 2566	2477	6456
Tx 430	2478	6710
Tx 431	2501	6845
Tx 2536	2508	6882
ATx 622	2662	6906
ATx 623	2757	6964
ATx 624	3051	6895
ATx 378	3464	7044
BTx 622	3477	7094
BTx 623	3574	7173
BTx 624	3612	7243
BTx 378	3620	7254
RTx 430	3625	7340
RTam 428	3627	7367
IS 530 C	3814	7379
1047	3911	7440
1121	3955	7444
1134	3956	7447
1139	4839	7452
1140	4884	7518
1141	5394	7524
1143	5530	7535
1151	5554	7537
1159	5747	7541
1166	5769	

Millet:

Tift 23B Early	Tift 23DA x 18DB
Tift Gahi 3	Tifleaf 1
Tift 186	Tift 383
Tift 23DB	Germplasm mix
Dove Proso	

Vegetables:

Bean: G 698 G 699 G 700 G 701

Cabbage: B 1683 B 2013

Cowpea: CR 17-1-13 CR 18-13-1 CR 17-1-34 CR 22-2-21

Sweet Potato: Redmar Centennial Jewel MD 715

Tomato:			
Homestead	Southland	Dorchester	MD 150
Patriot	T 3691	MD 151	MD 152
T 3790	Westover	MD 153	

Watermelon: Charleston Gray Tetra-4 Summerfield

Itinerary of the U. S. Germplasm Team
August 13 to September 13, 1979

Aug. 13	Briefing at the U. S. Department of Agriculture in Washington, D. C.
Aug. 14	Air flight from Washington, D. C. to Narita, Japan
Aug. 15	Day lost crossing the international date line
Aug. 16	Remained in Narita. Flight to Beijing (Peking) delayed due to a storm in the China Sea
Aug. 17	Flew to Beijing. Discussed the trip itinerary with the agricultural attache, Bill Davis, and members of the Chinese Academy of Agricultural Sciences (CAAS). A banquet was held in the evening by the CAAS.
Aug. 18	Visited the Crop Germplasm Research Institute, Chinese Academy of Agricultural Sciences, Beijing. Visited the Vegetable Research Institute, Chinese Academy of Agricultural Sciences, Beijing.
Aug. 19	Flew to Harbin (Harbin), Heilongjiang (Heilung Kiang) province
Aug. 20	Visited the Heilongjiang Agricultural Academy, Harbin, and the Vegetable Research Institute, Heilongjiang Agricultural Academy, Harbin.
Aug. 21	Visited the Shin Hua commune, Shue Hua, Heilongjiang
Aug. 22	Research discussions with staff of the Heilongjiang Agricultural Academy
Aug. 23	Flew to Shenyang (Shenyang, Mukden), Liaoning (Liaoning).
Aug. 24	Visited the Liaoning Agricultural Academy, Shenyang, Liaoning
Aug. 25	Visited the Tieling Agricultural Research Institute, Tieling, Liaoning
Aug. 26	Visited the Shenyang Agricultural Research Institute, Shenyang, Liaoning. Flew to Jinan (Tsinan), Shandong (Shantung)
Aug. 27	Visited the Shandong Agricultural Academy, Jinan, Shandong
Aug. 28	Rest and sightseeing near Jinan
Aug. 29	Visited the Feicheng Peach Research Center, Tian county, Feicheng, Shandong and the Shandong Agricultural College, Taian, Shandong
Aug. 30	Visited the Shandong Agricultural College. Travelled by train to Yantai (Chefoo), Shandong
Aug. 31	Visited the Yantai Agricultural Research Institue, Yantai, Shandong and Sun Quang production brigade, Cenia commune, Yantai. Travelled by bus to Qingdao (Tsingtao).

Sept. 1 Travelled by train to Beijing

Sept. 2 Visited the Agricultural Attache, Bill Davis. Travelled by train to Zhengzhou (Chengchow), Henan (Honan)

Sept. 3 Visited the Henan Agricultural Academy, Zhengzhou and the Fruit Tree Institute, Chinese Academy of Agricultural Sciences, Zhengzhou

Sept. 4 Visited the Chilying commune, Hsin-Hsian, Henan and the Hsin Hsian Agricultural Research Institute, Hsin Hsiang, Henan

Sept. 5 Visited the Zhengzhou Vegetable Research Institute, Zhengzhou, Henan. Held discussions with staff of the Henan Agricultural Academy. Travelled by train to Xian, Shanxi.

Sept. 6 Visited the Xian Agricultural Research Institute, Xian, Shanxi and the Five Star Production Brigade, Red Flag Commune, Xian, Shanxi

Sept. 7 Visited the Shanxi Agriculture and Forestry Academy and the Northwest Agricultural College, both located at Wu Kong, Shanxi

Sept. 8 Visited the Fruit Tree Institute, Shanxi Agriculture and Forestry Academy, Meshan, Shanxi

Sept. 9 Rest and sightseeing near Xian

Sept. 10 Traveled to Beijing. Sightseeing near Beijing

Sept. 11 Sightseeing near Beijing

Sept. 12 Discussions on germplasm exchange and cooperative research with representatives of the Chinese Academy of Agricultural Sciences, Beijing. Banquet given in appreciation of the excellent arrangements made throughout the trip by our Chinese hosts.

Sept. 13 Departure from Beijing, 0918 9/13/79.

PLANT DISEASES AND PATHOGENS IN PRC

PEKING AND VICINITY

HOST	DISEASE	PATHOGEN
Asparagus bean (*Vigna sesquipedalis*)	Rust	*Uromyces appendiculatis*
Chinese cabbage (Brassica campestris L.)	Black rot 1/	*Xanthomonas campestris*
Cucumber	Cucumber blight 1/	*Phytophthora sp.*
Pepper (sweet)	"Virus" 1/	(?)
Tomato	Bacterial wilt	*Pseudomonas solanacearum*
	Late blight 1/	*Phytophthora infestans*
	Streak	Virus
	Verticillium wilt	*Verticillium albo-atrum*
	"Virus" 1/	Probably Tobacco mosaic virus (TMV). Possibly also Cucumber mosaic virus. Others

1/ Stated to be of major importance.

HOST	DISEASE	PATHOGEN
Cucumber	Powdery mildew 1/	*Erysiphe* sp.
Corn	Head smut	*Sphacelotheca reiliana*
	Northern leaf blight	*Helminthosporium turcicum*
	Southern leaf blight	*Helminthosporium maydis*
Eggplant	Fusarium wilt 1/	*Fusarium* sp.
Pear	Fruit rot (Black rot) 1/	(?)
Potato	Late blight 4/	*Phytophthora infestans*
Sorghum	Charcoal rot 4/	*Macrophomina phaseoli*
	Head smut 3/	*Sphacelotheca reiliana*
Soybean	Anthracnose	*Colletotrichum dermatium* and/or *Glomerella glycines*
	Bacterial blight 1/	*Pseudomonas glycines*
	Brown spot	*Alternaria* sp.
	Cyst nematode	*Heterodera glycines*
	Downy mildew	*Peronospora manshurica*
	Fusarium wilt or blight	*Fusarium oxysporum*
	Mosaic 2/	Soybean mosaic virus (SMV)
	Pod and stem blight	*Diaporthe phaseolorum* var. *sojae*
	Purple seed stain	*Cercospora kikuchii*
Tomato	Early blight 1/	*Alternaria solani*
	Mosaic 1/	Tobacco mosaic virus (TMV)
Wheat	Leaf rust	*Puccinia recondita*
	Stem rust	*Puccinia graminis* var. *tritici*
	Stripe rust	*Puccinia striiformis*

1/ Stated to be serious on this host in the Harbin area.
2/ Stated to be serious only in the western part of the province.
3/ Main disease on this host at Shin-Hua Commune, Shue Hua County.
4/ Serious on this host at Shin-Hua Commune, Shue Hua County.

LIAONING PROVINCE

HOST	DISEASE	PATHOGEN
Adjuki or Urd bean	Rust	*Uromyces* sp.
Corn	Chlorotic flecking	Viral ?
	Common smut	*Ustilago maydis*
	Head smut[1/]	*Sphacelotheca reiliana*
	Late wilt[3/]	*Cephalosporium maydis*[3/]
	Northern leaf blight[2/]	*Helminthosporium turcicum*
	Rust	*Puccinia sorghi*
	Southern leaf blight	*Helminthosporium maydis*
	"Virus"	(?)
Cucumber	Downy mildew	*Pseudoperonospora cubensis*
	Verticillium wilt	*Verticillium albo-atrum*
Eggplant	Verticillium wilt	*Verticillium* sp.
Millet	Blast	*Pyricularia grisea*
	Downy mildew[1/]	*Sclerospora graminicola*
	Rust	*Puccinia* sp.
	Smut[2/]	*Ustilago* sp.
Pepper	"Virus"	(?)
Rice	Bacterial leaf blight[2/]	*Xanthomonas oryzae*
	Brown spot	*Helminthosporium oryzae*
	Rice blast[1/]	*Pyricularia oryzae*
	Sheath blight	*Pellicularia oryzae* (*Corticium sasakii*)

Sorghum	Anthracnose	*Colletotrichum graminicola*
	Head smut[1/]	*Sphacelotheca reiliana*
	Loose smut[2/]	*Sphacelotheca cruenta*
	Rust	*Puccinia purpurea*
	Small seed syndrome	(?)
	Wen Ky	(?)
Soybean	Alternaria leaf spot	*Alternaria* sp.
	Bacterial blight	*Pseudomonas glycinea*
	Cyst nematode	*Heterodera glycines*
	Downy mildew[2/]	*Peronospora manshurica*
	Leaf gray spot	*Cercospora sojina*
	Purple seed stain	*Cercospora kikuchii*
	Scab	*Sphaceloma glycines*
	Soybean rust	*Phakopsora pachyrhizi*
	"Virus"[1/]	Soybean mosaic virus. Others ?
Tomato	Early blight	*Alternaria solani*
	Late blight	*Phytophthora infestans*
	"Virus"	(?)

1/ Main disease on this host in the vicinity of Shenyang.

2/ Second most serious disease on this host in the vicinity of Shenyang.

3/ A high degree of uncertainty about this report.

SHANDONG PROVINCE

HOST	DISEASE	PATHOGEN
Corn	Northern leaf blight	*Helminthosporium turcicum*
	Smut	*Ustilago maydis*
	Southern leaf blight	*Helminthosporium maydis*
Cucumber	Downy mildew	*Pseudoperonospora cubensis*
Millet	Blast or blight	*Pyricularia grisea*
	Downy mildew	*Sclerospora graminicola*
	Red leaf	Probably a virus
	Rust	*Puccinea* sp.
Peach	Anthracnose	*Gleosporium lacticolor*
	Shot hole	Bacterium
Peanuts	Leaf spot	*Cercospora* sp.
	Rust	*Puccinia arachidis*
	(?)	Nematodes
Sorghum	Anthracnose and Red rot	*Colletotrichum graminicola*
	Gray leaf spot	*Cercospora sorghi*
	Head smut[1/]	*Sphacelotheca reiliana*
	Kernal-smut	*Sphacelotheca cruenta*
Soybean	Bacterial spot (Bacterial blight)[1/]	*Pseudomonas glycinea*
	Downy mildew	*Peronospora manshurica*
	Rust	*Phakopsora pachyrhizi*
	"Virus"[1/]	Soybean mosaic virus. Others ?

Sweet potato	Black spot	(?)
	Root knot nematode	*Meloidogyne* sp.
	Root rot	(?)
Wheat	Leaf rust	*Puccinia recondita*
	Stripe rust	*Puccinia striiformis*
	Take-all	*Ophiobolus graminis*

1/ Stated to be the principal disease(s) on this host in the province.

HENAN PROVINCE

HOST	DISEASE	PATHOGEN
Corn	Maize dwarf mosaic[6/]	Maize dwarf mosaic virus (MDMV)
	Northern leaf blight	*Helminthosporium turcicum*
	Southern leaf blight	*Helminthosporium maydis*
	"Virus"	(?)
Grape	Black rot	*Elsinoe ampelina*
	Downy mildew	*Plasmopara viticola*
	Rot	*Glomerella cingulata*
	Spot disease	*Cercospora vitis*
	White rot	*Coniothyrium diploidiella*
Millet	Rust	*Puccinia* sp.
Potato	(?)	Potato virus X
	(?)	Potato virus Y
	(?)	Leaf roll virus
Soybean	Bacterial blight	*Pseudomonas glycines*
	Bacterial pustule[2/]	*Xanthomonas phaseoli*
	Brown leaf blotch[4/]	*Mycosphaerella sojae*
	Brown spot	*Septoria glycines*
	Bud blight[1/]	Tobacco rinspot virus (TRSV)
	Pod and stem blight	*Diaporthe phaseolorum* var. *sojae*
	Pod blight or Pod rot[4/]	*Macrophoma mame*
	Ring leaf spot[4/]	*Aschochyta sojaecola*
	Scab[5/]	*Sphaceloma glycines*
	Sleeping leaf disease or Brown stripe	*Septogloeum sojae*
	Soybean mosaic	Soybean mosaic virus (SMV)

Sweet potato	(?)	*Fusarium* sp.
Wheat	Leaf rust	*Puccinia recondita*
	Powdery mildew	*Erysiphe graminis*
	Rosette stunt 3/	Virus vectored by a planthopper
	Soil borne wheat mosaic	Virus
	Stripe rust	*Puccinia striiformis*

1/ Serious in the vicinity of Zhengzhou.

2/ Most important bacterial disease of soybean in vicinity of Zhengzhou.

3/ Serious in northern part of the province.

4/ Not certain whether these occur in Henan Province or "somewhere" in China. Communication problem.

5/ Occurs in eastern part of privince but is not considered to be serious.

6/ Reputedly a "problem" in Henan.

SHAANXI PROVINCE

HOST	DISEASE	PATHOGEN
Apple	Crown gall	*Agrobacterium tumefasciens*
	Powdery mildew[3/]	*Podosphaera leucotricha*
	"Virus"	(?)
	(?)	*Marsonia mali*[3/]
	(?)	*Phyllosticta pirina*
	(?)	Valsa mali[3/]
Chinese cabbage	Bacterial wilt[1/]	(?)
	Downy mildew[1/]	*Peronospora parasitica*
	Mosaic	Probably Turnip Mosaic Virus
Citrus sp.	Citrus canker	*Xanthomonas citri*
Cowpea	Rust	*Uromyces vignae*
Cucumber	Bacterial lesions[2/]	(?)
	Downy mildew[1/]	*Pseudoperonospora cubensis*
	Fusarium wilt[1/]	*Fusarium* sp.
Date	"Virus"	(?)
Grape	Anthracnose	*Elsinoe ampelina*
	White rot	*Coniothyrium diplodiella*
Key orange (*Citrus reticulata*)	(?)	*Colletotrichum gleosporioides*
Pear	Rust	*Gymnosporangium yamadae*
	Scab[3/]	*Venturia pyrina*
Pepper (sweet)	Mosaic	Virus
	Streak	Virus. A strain of TMV?
Prunus sp.	Bacterial leaf spot	*Xanthomonas pruni*

Soybean	Bacterial blight	<u>Pseudomonas</u> <u>glycinea</u>
	Soybean mosaic	Soybean mosaic virus (SMV)
Tomato	Early blight 1/	<u>Alternaria</u> <u>solani</u>
	Mosaic	Tomato mosaic virus
	"Virus" 1/	(?)
Watermelon	Mosaic	Sweet melon mosaic virus?
		Cucumber mosaic virus

1

2

3

4

1/ Serious at Northwest College of Agriculture, Wu Kung (west of Xian).

5

2/ Small angular lesions surrounded by a narrow ring of watersoaked tissue.

6

3/ Serious vicinity Fruit Tree Research Institute, Me Shan County, on northern flanks of Chin Ling Mts. (Tsinling Shan), ca. 110 Km west of Xian.

Attachment 6

SEEDS OF CROP VARIETIES AND BREEDING LINES COLLECTED IN THE PEOPLES REPUBLIC OF CHINA

U. S. Germplasm Team
August 17-September 13, 1979

Soybean[1/]:

Sui nung No. 3
Feng Shou No. 10
An 70-4167
Heh Ho No. 3
Heh Nung No. 10
Heh Nung No. 11
Heh Nung No. 16
Heh Nung No. 26
Tieh Feng No. 18
Ho 76-6045

Sorghum[1/]:

Heh Lung Pu Yu No. 4A
Heh Lung Pu Yu No. 4B
Heh Lung Pu Yu No. 5A
Heh Lung Pu Yu No. 5B
Heh Lung Pu Yu No. 8A
Heh Lung Pu Yu No. 8B
Heh Lung Pu Yu No. 9A
Heh Lung Pu Yu No. 9B
Heh Lung Pu Yu No. 30A
Heh Lung Pu Yu No. 30B
Heh Lung Pu Yu No. 11A
Heh Lung Pu Yu No. 11B
Heh Lung Pu Yu No. 37A
Heh Lung Pu Yu No. 37B
Heh Lung Pu Yu No. 48A
Heh Lung Pu Yu No. 48B
Heh Lung Pu Yu No. 50A
Heh Lung Pu Yu No. 50B
Heh Lung Pu Yu No. 53A
Heh Lung Pu Yu No. 53B
Hui No. 1
Hui No. 3
Hui No. 4
Hui No. 5
Hui No. 9
Hui No. 39
Hui No. 13
Hui No. 15
Hui No. 16
Hui No. 17
Hui No. 20
Hui No. 21
Hui No. 23
No. 7384
Sui Hui No. 1
Ai Kao Liang
Kong Ke Lao Mei Hong
Ta Loh Chui
Kao Hu Shu
Sui Za No. 1
Ton Za No. 2
Jua Ngo Tzu Kao Liang
Yuan Yu 7036
Yuan Yu 7047
Tsan Kao Liang
Ai Shu Shu
Lao Hong Wu Mien
Luo Tzu Kao Liang
Ta Lo Chui
Ming-Chuan-Hsien Ta Quing Chich
Sui-Hsien Da Quing Chia
Wu Chang Ta Lo Chui
Wang Kuei Hong Ke
Hu Lan Hong Ke
Hu Lan Shao Hong Ke
Mu Lan Hong Ke
Pa-Yen Hong Ke Pa Yeh
Ping-Hsien Hong Ke Pa Yeh
Wu-Chang Shao Hong Ke
Mu-Lan Shao Hong Ke

[1/] Provided by the Chinese Academy for Agricultural Sciences, Germplasm Research Institute.

Millet (Setaria):

Lu Shih Gih Huan Luen
Lu Gu No. 3
Yin Tien Han
Liu Tiao Ching
Shao Mo Ching
Tao Pa Chi
Sui Gu No. 1
Lung Gu No. 23
Lung Gu No. 24
Pei Huang No. 2
Pei Huang No. 4
Ho-erh-ping No. 5
Ho-erh-ping No. 11
No. 7441
Cheng-Gu No. 2

Millet (proso):

Lung Shu No. 5
Lung Shu No. 7
Lung Shu No. 14
Lung Shu No. 16
Lung Shu No. 18

Bean :

Cu Dou Chu-Cheng Chia Yu Tou

Cabbage :

Kan Lan: Heh Yeh da Ping Tou

Chinese Cabbage[1/]:

Da Bai Cai: (Fu-san Xiuo Bao Tou)

Cucumber:

Huang Kua: (Tsin-san x Yeh 124) F_1
Huang Kua: (Tsin-san x Yeh 159) F_1
Za Zuan No. 1
Chang Chung
No. 364715

Muskmelon:

Hami Gua

Pepper:

Chou Pi La Tsiao
Nanking Shao Tsiao
Erh Fu Tou
Kuei-Yang La Tsiao

Radish:

Wo Bo: Wei-Hsien

Sweet Potato:

Shang Yang Huang
Kuo Tzo No. 1
No. 7507
No. 72-8
'Yellow Sun Flower'
Liao Shu No. 224
Liao Shu No. 40
Liao Shu No. 205
No. 750.1
Self Fertile No. 1

Tomato:

Tan Hua Fan Chieh 73-3 2-4
Chian Mih F_1
Tsao Fen No. 2
Ta Yeh Tso Fun
No. A652

Watermelon:

Si Kua: Zao Hua
Chou Cheng Hong
Tso Hua
Chou Cheh Red

Persimmon:

Si Hong Fei: 72-4

U. S. PLANT GERMPLASM TEAM

August 30, 1979

Mr. Jen Cheh
Secretary General
Chinese Academy for
Agricultural Science
Beijing
People's Republic of China

SUBJECT: Germplasm Exchange and Scientific Cooperation

Dear Mr. Jen:

The mission of the United States Germplasm Team is to study and arrange for the exchange of germplasm with the People's Republic of China. Research scientists of both countries share the belief that plant germplasm will provide the foundation for a productive agriculture for the future. Agriculture of both countries will benefit from the cooperation on germplasm exchange that is developed during these discussions.

In preparation for our discussions with your staff in Beijing at the end of our visit, we would like to suggest possibilities for future exchange of plant germplasm, cooperative research and scientific exchange.

I. Germplasm Exchange:

A. Soybean

The soybean is an important crop in the PRC and USA. Both countries have breeding objectives that require the broadest sources of genetic variability available in the world. We suggest that our genetic collections could be exchanged in two steps. The first step would be to exchange our entire collections of the cultivated type, Glycine max (L) Merrill. This would include native varieties in the present collections, varieties developed by

hybridization or mutation, and additional varieties collected or developed during the period of the exchange. We propose two alternatives.

Alternative 1. The entire collections of domestic varieties from both countries could be exchanged early in 1980. Each country would provide the other a seed sample of all entries, including currently grown varieties.

Alternative 2. The collections of domestic varieties from the two countries could be exchanged over a five year period. There are several methods by which this could be accomplished. Two possible methods are:

1. Each year of the five year period the entire collection of two U.S. maturity groups and the entire collection of one or two provinces of the PRC could be exchanged.

2. Each year of the five year period one-fifth of each of the 10 U. S. maturity groups and one-fifth of the collection of each province could be exchanged.

The second step of the soybean germplasm exchange would be the collection and evaluation of the wild species, Glycine soja, and related genera. Plans for such a cooperative research project could be ~~developed during exchange of the domestic collec-tion~~. This subject is discussed further in this memo under the section on cooperative research.

B. Sorghum

We suggest the following collections of sorghum could be exchanged between the PRC and USA. The following materials would be available from the U.S.A.:

1. Numbered plant introductions that flower under U. S. conditions -- approximately 500.

2. Texas collection of old lines and releases -- approximately 500 - 800 lines.

From the PRC, a representative sample of the diversity contained in collections in each of the following five provinces should be considered: Heilongjiang, Liaoning, Jilin, Shandong and Shanxi.

C. Millet

We suggest that there be a complete exchange of the genetic diversity of material in both countries The number and types of materials are yet to be determined.

D. Vegetables

The U. S. Germplasm Team suggests two areas relating to the exchange of vegetable germplasm be discussed:

1. the vegetable crop species to be included, and

2. the schedule and procedure for the exchange.

We suggest the following species in the order of priority in which they are listed:

Bean (*Phaseolus* spp)
Cow pea (*Vigna* spp)
Cucumber (*Cucumis* sativus)
Sweet potato (*Ipomoea batatas*)
Cantaloupe (*Cucumis melo*)
Watermelon (*Citrulus vulgaris*)
Egg plant (*Solanum melongea*)
Onion (*Allium* spp.)
Tomato (*Lycopersicon esculentum*)
Pepper (*Capsicum spp*.)

We would also welcome discussions on the exchange of other vegetable species that may be of particular interest to scientists in the PRC.

We should also discuss a tentative schedule and procedures by which the vegetable germplasm could be exchanged. We suggest the following alternatives for your consideration:

1. The exchange of 2 - 3 crop species each year beginning in 1980 and continue until all the species agreed upon have been exchanged.

2. Exchange approximately one-fifth of the entries in each species held by each country each year from 1980 through 1985.

3. The complete exchange in 1981 of all entries of all the species agreed upon.

It is our opinion that options one or two would be preferable because they would allow more time for cataloging each item and assembling them in an orderly fashion. We suggest further that a complete description be provided with each item exchanged.

II. Cooperative Research:

A. Soybean

We suggest that cooperative research on soybeans be developed in three areas.

1. Nitrogen Fixation

Scientists in the U. S. have found that some Rhizobium japanicum isolates fix above average amounts of nitrogen on one or more soybean genotypes, and that certain R. japonicum - soybean genotype combinations fix only small amounts of nitrogen.

Scientists have theorized that in the PRC, the home of the soybean, highly efficient

combinations of R. japonicum and soybean varieties may have evolved. We have collected soybean nodules in each of the provinces that we have visited to date. We propose to compare the nigrogen fixation of these isolates on varieties of soybeans from which the nodules were collected with that on soybeans developed in the U.S.A. Making these and other comparisons will enable us to determine the extent to which selection for compatability between soybean genotypes and the bacteria has proceeded in an evolutionary manner. These preliminary tests should indicate if further work in this area is needed. To complete this work, we will need seeds from the various soybean varieties from which nodules have been collected. A list of these varieties will be provided.

2. Soybean Cyst Nematode Evaluation

The soybean cyst nematode continues to be a threat to soybean production in certain areas of the U. S., even though varieties resistant to four races have been developed. The nematode is also present in China. The fact that germplasm which enabled U. S. scientists to develop varieties that are resistant to four races originally came from China suggests that these same races may be present also in China.

We suggest that cooperative research be discussed with the following objectives:

(a) Identifying the number of races that are present in each country and identify those that are common to both.

(b) Screen existing germplasm for resistance to all known races of nematode.

3. Genetic Diversity

The varieties of soybeans used commercially are relatively few and often have a common genetic ancestry. A source of genetic diversity that is relatively unexplored is the wild species, Glycine soja, and related species and genera. We suggest that cooperative research be discussed to evaluate the ancestry of the soybean, toxonomic relationships, and the usefulness of the wild species for breeding. We suggest that scientists in both countries work cooperatively to develop the plans and skills needed to properly research the problem.

B. Sorghum

The importance of a further understanding of the adaptation of Sorghum bicolor germplasm for yield stability, its specific quality traits, and its response to diseases and insects is paramount. We suggest that cooperative research would be useful to evaluate the germplasm for its potential for extending adaptation and to more clearly define the disease and insect problems in both countries. We suggest the following:

1. Establish an international adaptation test which would allow the two countries to compare yield, agronomic characteristics, and related adaptation factors could be jointly documented.

2. Establish an international disease and insect nursery which would allow the evaluation of disease similarities and reactions on important sorghum germplasm.

3. Establish a nutritive quality and food type nursery which would allow the evaluation under different environmental conditions in the two countries of those sorghums believed to possess high nutritive quality or special food uses.

C. Millet

We suggest that scientists of both countries consider cooperative research on screening the millet collections for quality characteristics. We suggest two areas for cooperative work:

1. Digestibility of the fodder: This could be done on a large number of lines using the laboratory technique used by scientists at the Coastal Plain Experiment Station in Georgia.

2. Seed protein and other chemical characteristics of the seed:

It would be desirable to grow the material to be evaluated in both the PRC and in the USA. This would provide information on the performance of the germplasm in both countries and establish the genotype response to different climatic conditions.

D. Vegetable Crops

Assuming that the exchange of germplasm will proceed and that a minimum description will accompany each seed lot being exchanged, we suggest that it would also be valuable to exchange evaluation data of each item after it has been evaluated by the receiving country. New information developed about resistances to diseases and insects would aid in the search for new sources of pest resistance in the future.

III. In addition to the crop species listed above, there are a number of plant genera of interest to us that we were unable to study during our brief visit. One group of plants of particular interest is the genera of Eremochloa, Cynoden and Zoysia, grasses that are common in the southern part of the PRC. Another group includes the native grasses in western China. We hope that future exchanges of germplasm can include these species. At this time we would appreciate having the name(s) of scientist(s) who are familiar with these grasses so that discussions can be initiated through correspondence.